Re-emission Model

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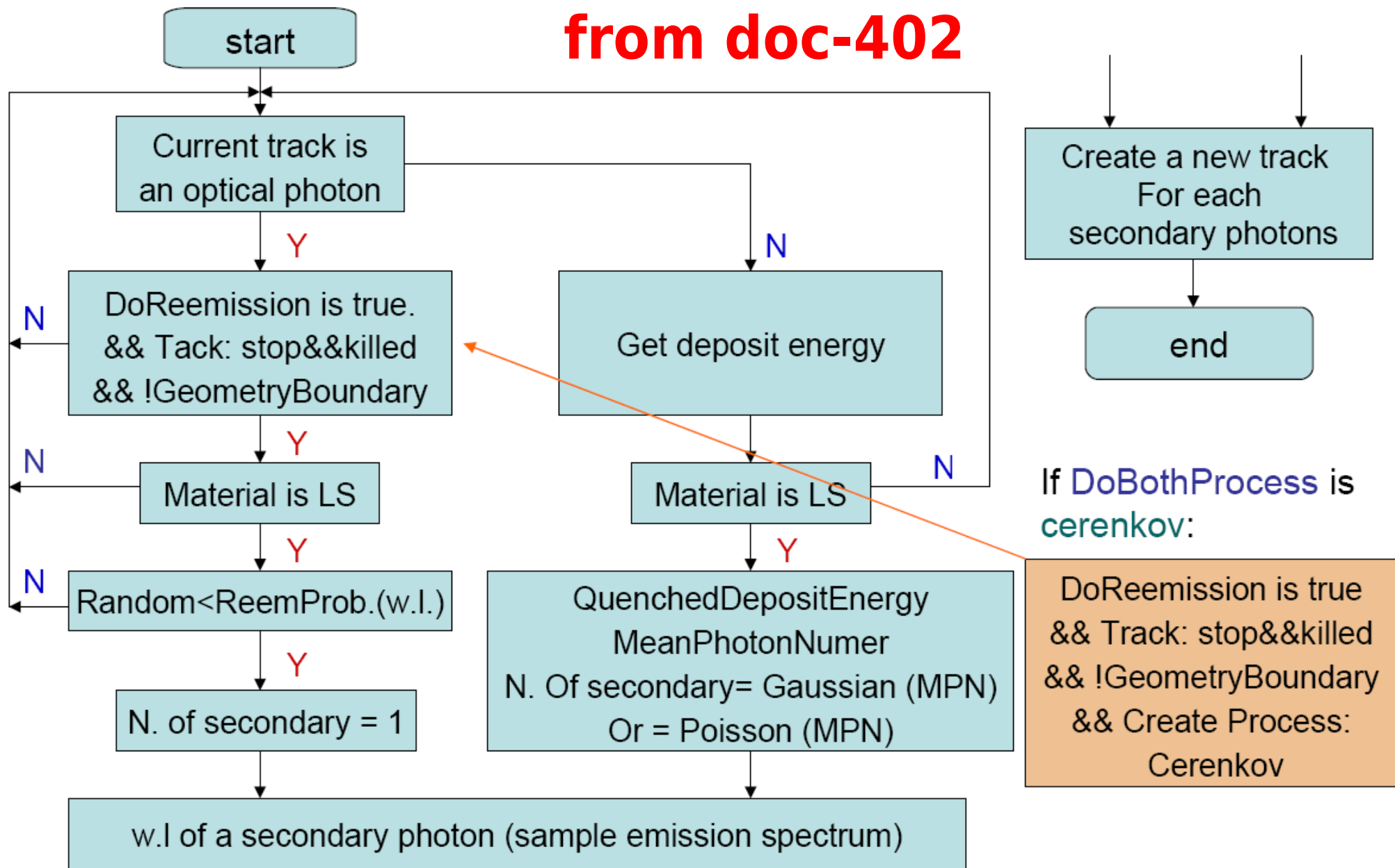BNL Daya Bay Meeting
August 14, 2009

Background

Geant doesn't do re-emission of absorbed optical photons.

Re-emission was added to G4dyb (part of the scintillation code) by Weili in Sep 06, explained in doc-402 and doc-643.

Seems to be based on GLG4Scint from GLG4sim (a Geant4 simulation of a generic liquid scintillator anti-neutrino detector, which is based on Kamland's simulation).

The reemission process in dywScintillation

from doc-402

start

Current track is an optical photon

DoReemission is true. && Tack: stop&&killed && !GeometryBoundary — Y

Material is LS — Y

Random<ReemProb.(w.l.) — Y

N. of secondary = 1

w.l of a secondary photon (sample emission spectrum)

Get deposit energy — N

Material is LS — Y / N

QuenchedDepositEnergy
MeanPhotonNumer
N. Of secondary= Gaussian (MPN)
Or = Poisson (MPN)

Create a new track For each secondary photons

end

If DoBothProcess is cerenkov:

DoReemission is true && Track: stop&&killed && !GeometryBoundary && Create Process: Cerenkov

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Overview

The process DsG4Scintillation is called for every step of a track.

If the track is NOT an optical photon, the process handles the generation of some number of optical photons by scintillation.

If the track IS an optical photon, the process checks to see if the photon has been absorbed and if so, either 0 or 1 photon is created based on the re-emission probability.

Details

a flag to allow re-emission

a flag to choose re-emission only for optical photons generated by Cerenkov or for all optical photons

a photon has been absorbed if:
aTrack.GetTrackStatus()==fStopandKill &&
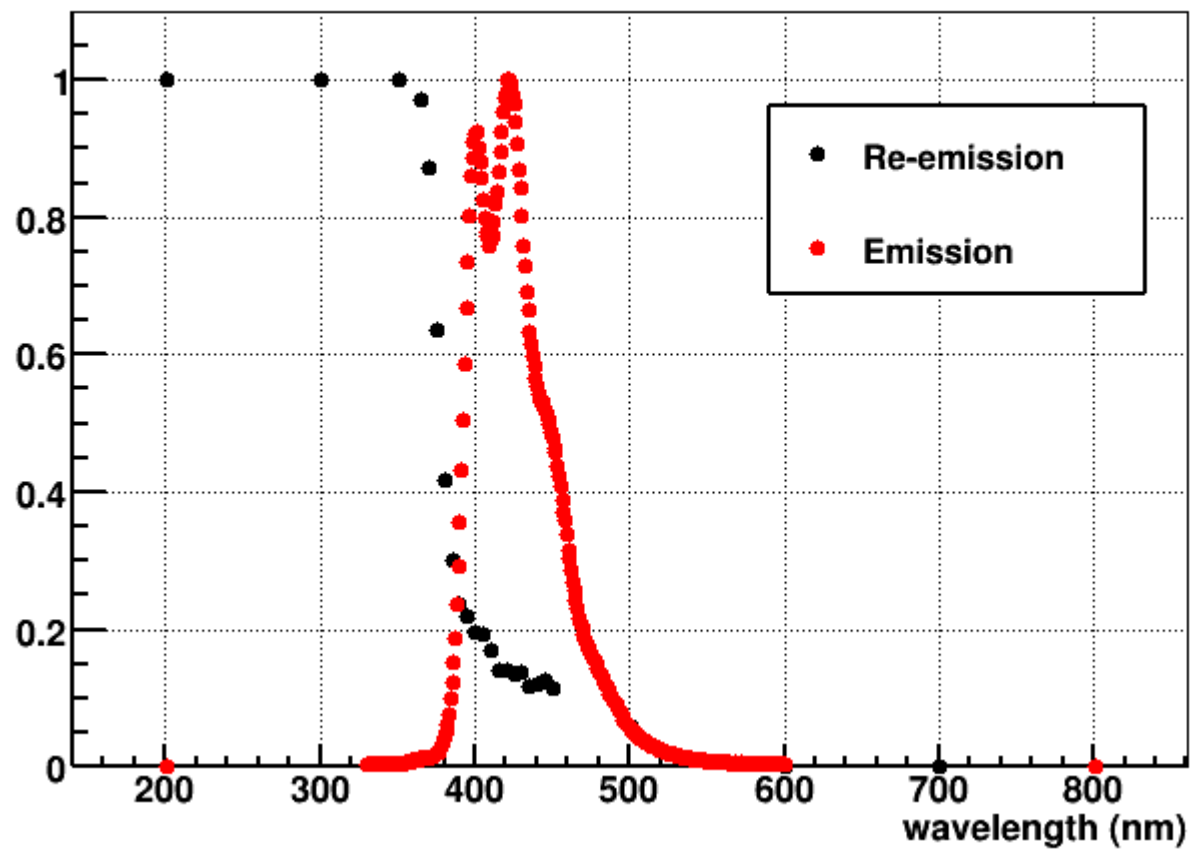aStep.GetPostStepPoint()->GetStepStatus() != fGeomBoundary
(if the track is dead and we're not at a boundary)

energy of the re-emitted photon is determined by sampling the scintillator emission spectrum
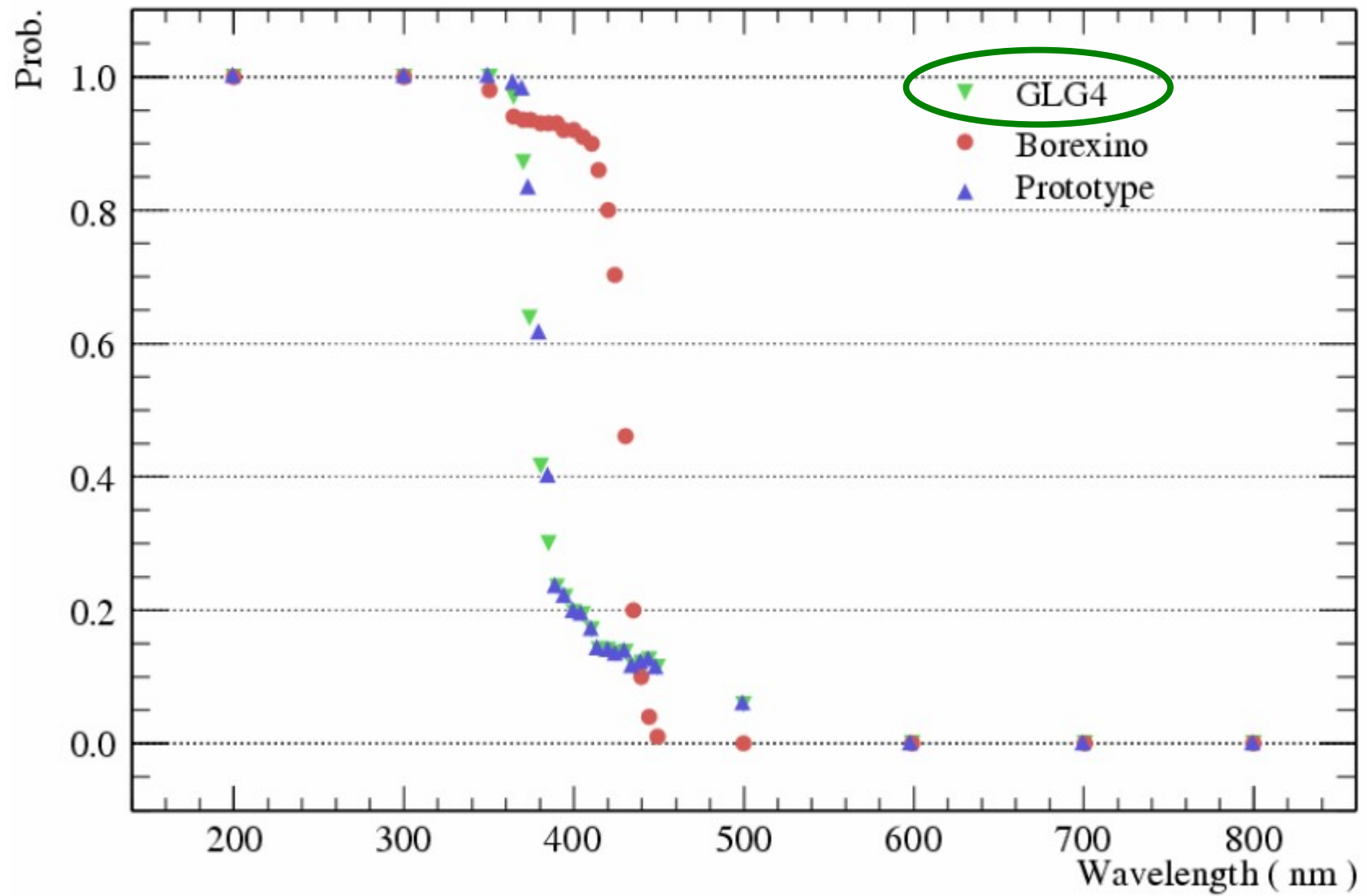timing related to scintillator time constant

Re-emission Probability

Re-emission Probability

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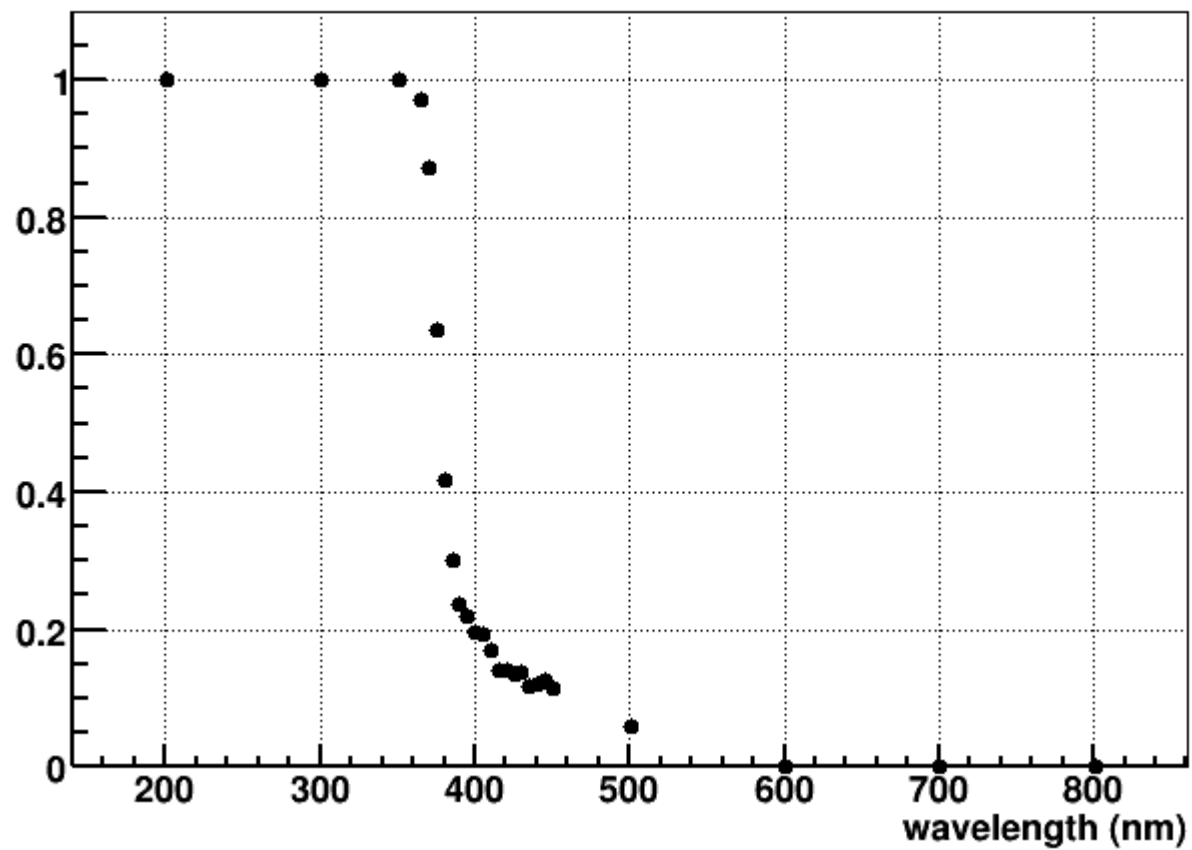
from doc-643

Planned Measurements...
Soon

I contacted Zhimin (IHEP), who described plans for a measurement of re-emission in doc-2985 in Dec 08. He said results are coming soon.